AMG-19
Federation Management
Technical Exchange

18 June 1997

Background - Technical Exchanges

- **HLA evolution is based on feedback from users**

- **Important to establish a mechanism for capturing user experiences in areas of specific interest**

  - **Technical exchanges are a mechanism to identify and explore potential issues**

  - **Share information on plans and results of issue investigations**

  - **Results are reported back to the AMG**

Federation Management Technical Exchanges

- **Fourth in series of technical exchanges in federation management**
  - First focused on issues of linking federations and federates with multiple connections to the RTI
  - Second focused on management object model and its use
  - Third reviewed progress in linking federations and federates with multiple connections to the RTI

- **This technical exchange addressed progress with the bridge federate analysis and the use of MOM**
  - Bridge federate functional analysis update
  - Update on MOM applications
    - Federation Management Tools (FMC) (AEgis)
    - STOW Distributed Exercise Manager (DEM)(STRICOM)
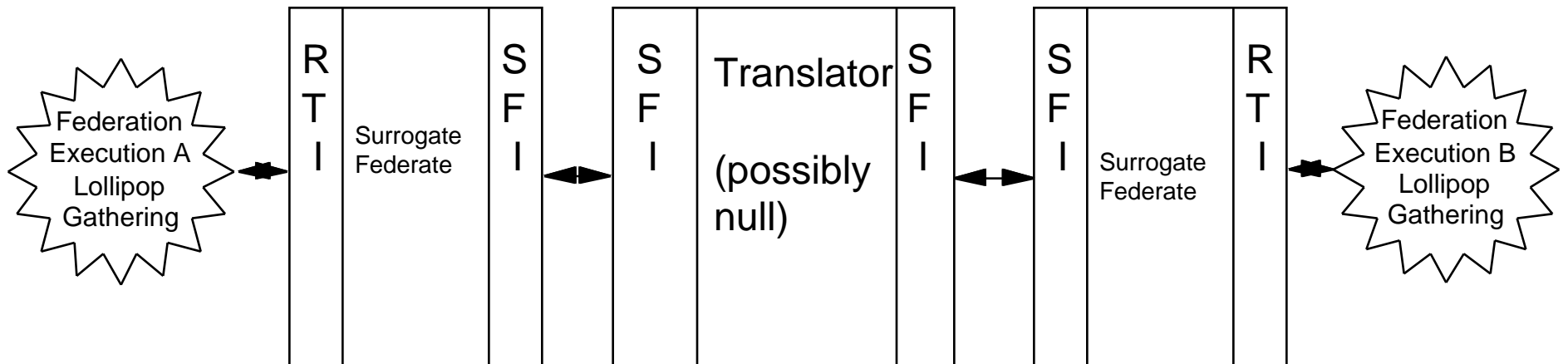   - Federate testing support tools (GTRI)
  -

Federation Management Technical Exchange

- **Held on 29 April at DMSO**

- **~ 20 participants**

- **Topics include**
  - **Bridge federate functional analysis update (Reed Little, SEI)**
    - **SBD Collaboration Gateway Manager (Gordon Miller, Ball)**
  - **Update on MOM applications**
    - **Federation Management Tools (FMC) (Ron Sell, AEgis)**
    - **STOW Distributed Exercise Manager (Greg Schow, STRICOM)**
    - **Federate testing support tools (Thom McLean, GTRI)**

Bridge Federate

- **Bridge federate is a**
  - Federate which participates in two federation executions and hence 'bridges' the two

- **Uses of a bridge federate**
  - Any multi "execution" exercises
  - Linking federation executions operating at different security levels
  - Linking executions using different RTI implementations
  - Combine federations with different time mechanisms

Notional Bridge Architecture

Federation Execution A Lollipop Gathering — RTI / Surrogate Federate / SFI — SFI / Translator (possibly null) / SFI — SFI / Surrogate Federate / RTI — Federation Execution B Lollipop Gathering

Bridge Federate Functional Analysis Status

- **Beginning with two federation execution example**

- **Use case approach based on I/F Specification service classes**

  - **Employed to determine Surrogate Federate and SFI requirements**

- **Represented in terms of event traces**

- **Bridge federate analysis will provide basis for understanding requirements for 'guard federate' in security architecture (special case of bridge federate)**

- **Plans to follow functional analysis with prototype development to exercise bridge federate in different federation configurations (CCTT, MoDSAF, EAGLE candidate participants)**
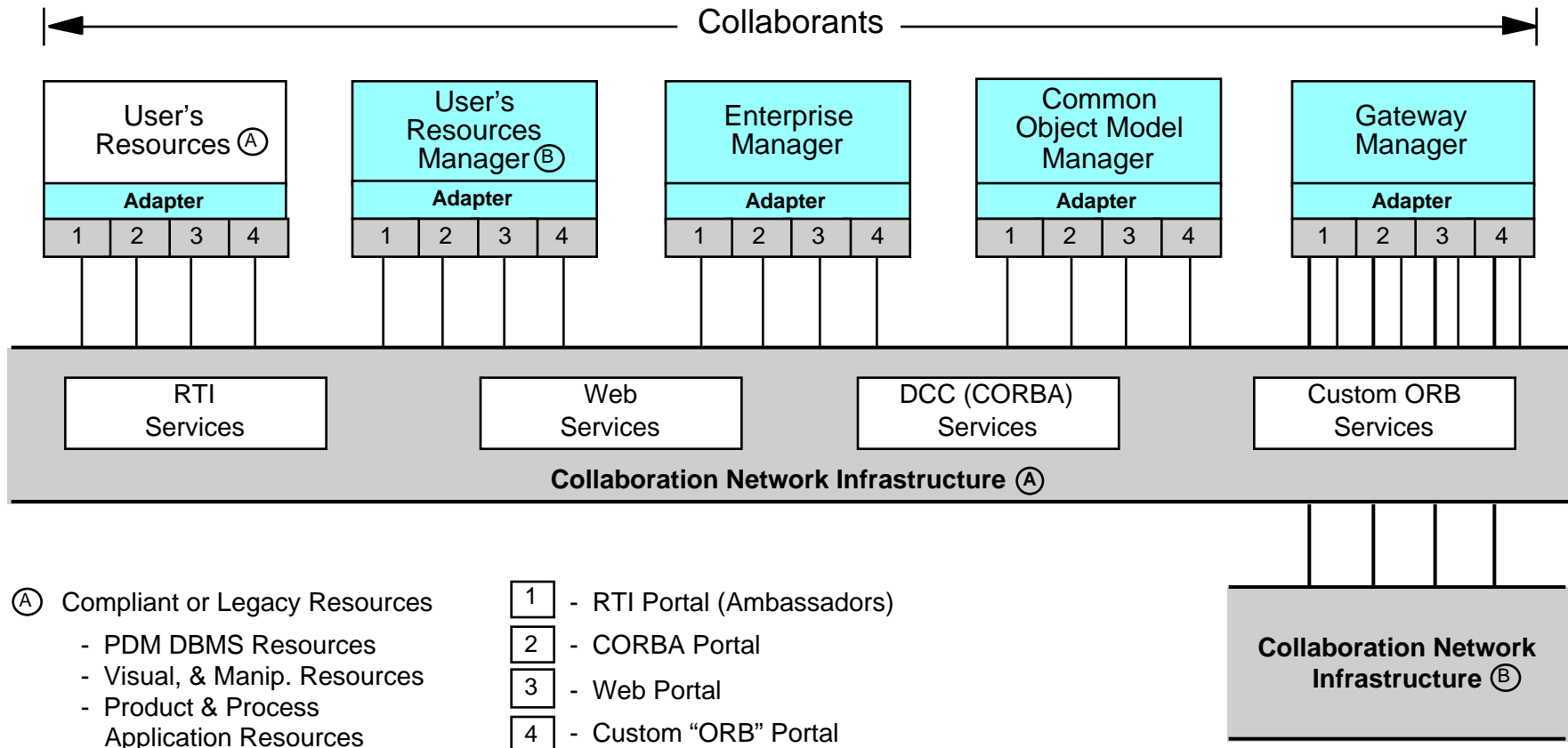
Use Cases

- **Employed to determine Surrogate Federate and SFI requirements**

- **Based on I/F Specification service classes**

- **Stylized English**
  - **adding event traces**

Bridge Prototype

- **Objective**
  - support the functional analysis
- **Plans**
  - SAIC-Orlando will develop and test
  - Use CCTT-SAF and/or MODSAF
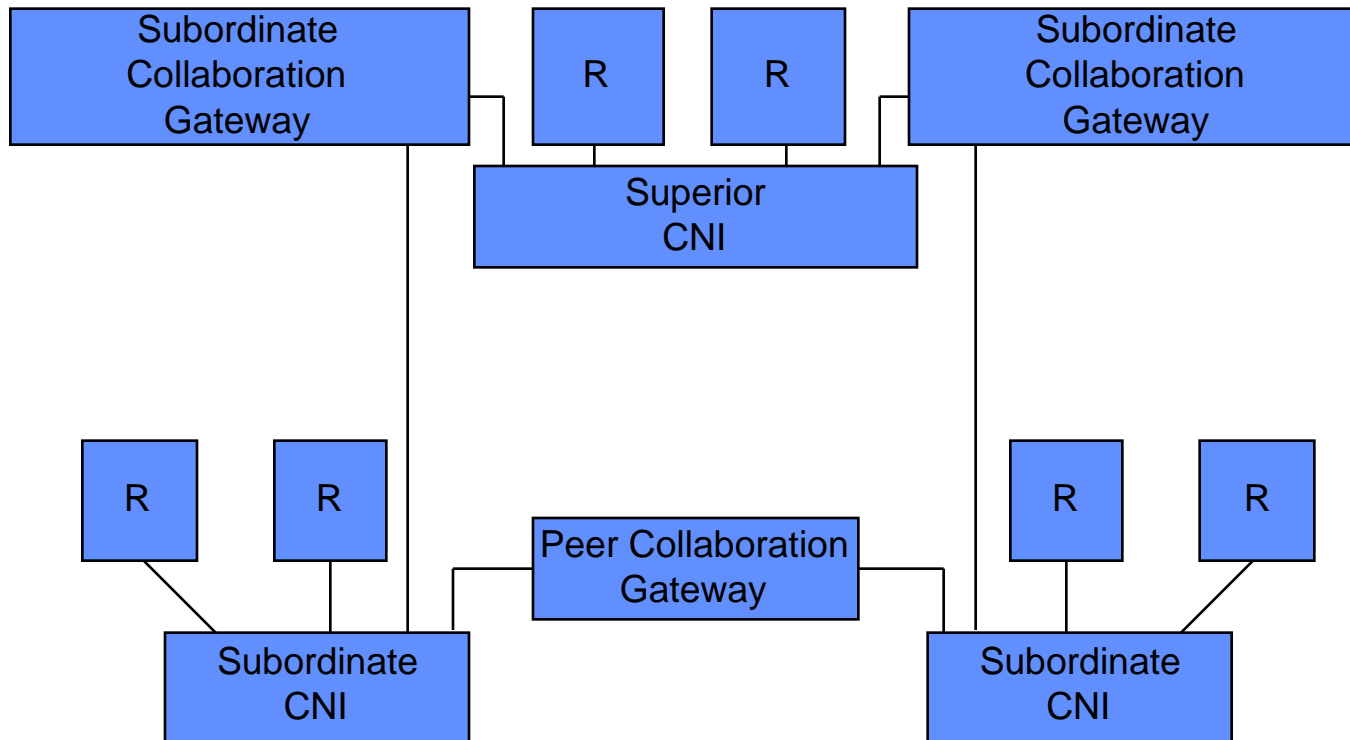 - Possibly use EAGLE to test time related aspects

Top-Level SBD System Processing Architecture

Collaborants

User's Resources Ⓐ	User's Resources Manager Ⓑ	Enterprise Manager	Common Object Model Manager	Gateway Manager
Adapter	**Adapter**	**Adapter**	**Adapter**	**Adapter**
1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4

RTI Services   Web Services   DCC (CORBA) Services   Custom ORB Services

Collaboration Network Infrastructure Ⓐ

Ⓐ Compliant or Legacy Resources

- PDM DBMS Resources
- Visual, & Manip. Resources
- Product & Process Application Resources

1	- RTI Portal (Ambassadors)
2	- CORBA Portal
3	- Web Portal
4	- Custom "ORB" Portal

Collaboration Network Infrastructure Ⓑ

Adapter - Transforms and Routes Collaborant -
   Specify objects & attributes on a bi-direction
   basis for all types of communication

Ⓑ   User's Resource Managers

- GUI Manager
- Product & Process Model Repository Manager
- Product & Process Application Resource Manager

Collaboration Gateway Manager Concept

| Subordinate Collaboration Gateway | R | R | Subordinate Collaboration Gateway |

Superior CNI

| R | R | | R | R |

Peer Collaboration Gateway

Subordinate CNI   **Subordinate CNI**

R - Resources of Collaboration
CNI - Collaboration Network Infrastructure

Jobson/SBD/CGM_SBD

Collaboration Gateway Manager Requirements

- **Requirements**

  - **Component of the SBD Architecture which mediates all Collaboration Communications**

  - **Provides and performs data, object*, and control transforms.**

  - **Provides routing services through HLA and other protocols transparent to peer collaborants**

- **Services**

  - **Collaborants request data. Collaboration manager is then responsible for routine request, converting the data to the local COM* and delivering reply to requester.**

  - **Provides data to collaborants from external sources (non-local CNI) transparently**

  - **CGM can query super, sub, and peer collaborations to determine proper routing of requests**

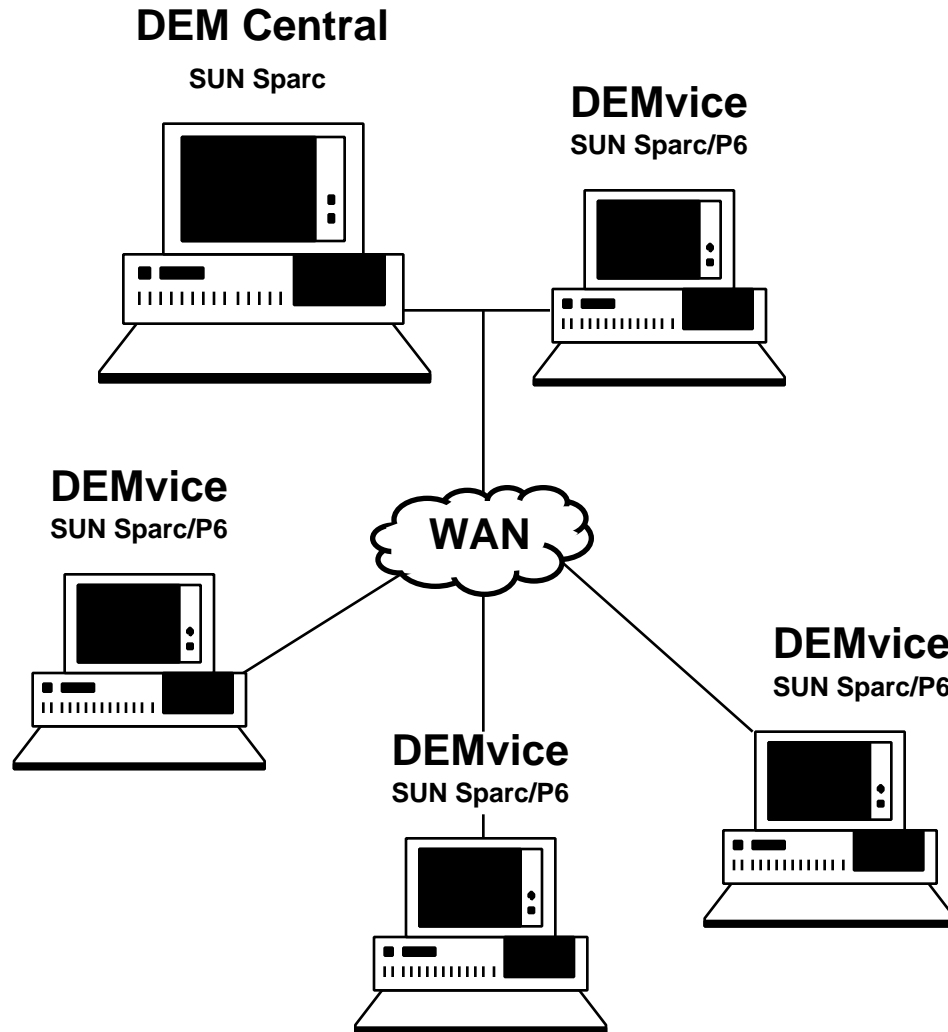 * SBD System Object includes: Entity Product, Process, Workload Mgmt, …etc.

What The Collaboration Manager Does

- **Transformation:**
  - **Object ID Mapping**
  - **Interaction and state-update handle mapping**
  - **Data conversion (units, types, …)**

- **Aggregation/Deaggregation:**
  - **Data needs to be presented in higher or lower level of granularity**
  - **Rules determine how to aggregate information**
  - **Requirements are driven by spectrum of SBD COM (Product & Process, workflow, …etc.)**
  - **Currently executing 5 week experiments which are broken into focus areas of collaboration connectivity, interoperation, and application**
  - **Development of CGM is required as part of the fundamental operation of a SBD System**
  - **CGM testing will be part of the experiment cycle.**

MOM

- **Update on MOM Capabilities**
- **Discussion of applications using MOM**
  - **Federation Manager/Controller**
  - **DEM**
  - **Federate Testing Support Tools**

DEM Configuration For STOW'97

DEM Central

SUN Sparc

DEMvice

SUN Sparc/P6

DEMvice

SUN Sparc/P6

WAN

DEMvice

SUN Sparc/P6

DEMvice

SUN Sparc/P6

DEM Central:
- Located at central location of WAN
- RTI Monitoring
- HLA Exercise Control
- Receives alarms from DEMvices
- Logs exercise statistics
- LAN-to-LAN connectivity

DEMvices:
- Located at each simulation LAN
- Network load monitoring
  - Packets in/out
  - Errors in/out
  - Collisions
- Workstation monitoring:
  - CPU utilization
  - SAF frame rate
- LAN-to-LAN Latency
- Alarms for CPU and network overload conditions
- Logs local LAN statistics
- Forward data and alarms to DEM Central
- MOM Channel monitoring

DEM Capabilities

DEM Central

DEMvice

WAN
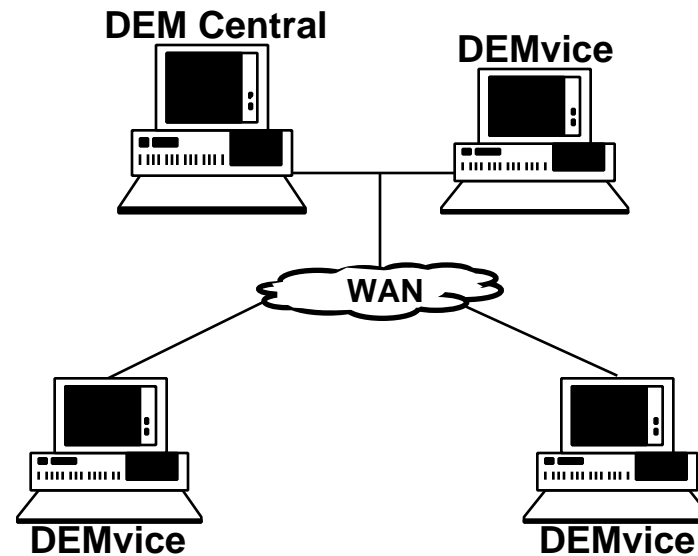
DEMvice

DEMvice

Exercise Logging

Informix used for logging
RTI and exercise control data logged at DEM Central
LAN-level data (network, SAF frame rate, MOM channel) logged at each DEMvice
Data is available for review during or after the exercise
DEM Central provides a remote query to access any DEMvice database

Exercise Control

Create/Destroy Federation
Pause/Resume Federation
Save/Restore Federation
All control commands are timestamped and displayed

Exercise Monitoring

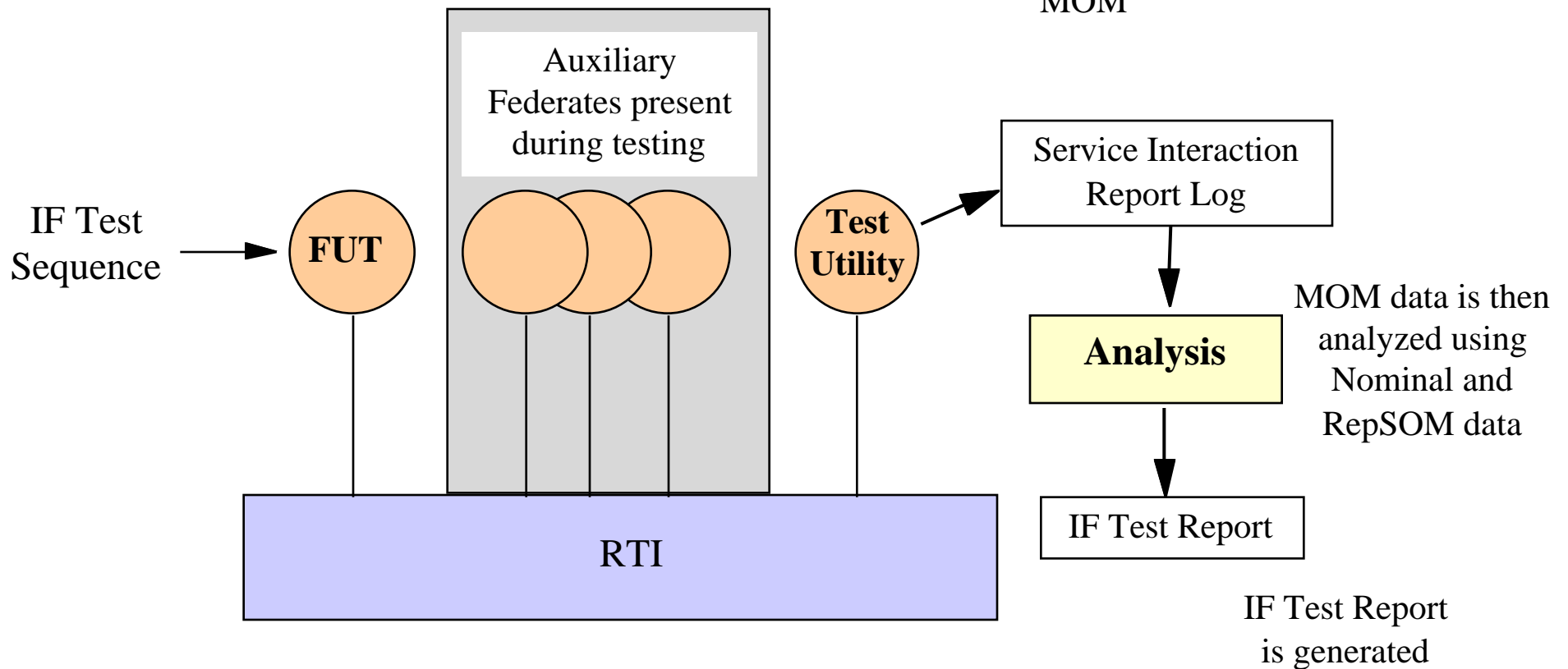| DEM Central	DEMvice
RTI Monitor ■ Federate Monitoring through MOM ■ RTI Updates Per Minute ■ DEM Central CPU Monitor	Network Load Monitoring ■ Packets In/Out ■ Errors In/Out ■ Collisions
Able to remotely view LAN-level data generated by all DEMvices	Host Load Monitoring ■ CPU Utilization ■ SAF Frame Rate
Receives alarms from DEMvice	Generates and forwards alarms
LAN-to-LAN Connectivity	LAN-to-LAN Latency

DARPA

ALL BUT WAR IS SIMULATION

IF Test Execution

FUT executes test sequence using scenario and auxiliary federates, as required

Test Utility joins federation and logs service invocations using MOM

Auxiliary Federates present during testing

IF Test Sequence

FUT

Test Utility

Service Interaction Report Log

Analysis

MOM data is then analyzed using Nominal and RepSOM data

RTI

IF Test Report

IF Test Report is generated

Next Steps

- **Next federation management technical exchange scheduled for 23 July at DMSO**

- **Topics include**

  - **Bridge federate functional analysis and prototype update**

  - **Update on MOM applications -- initiate effort to define MOM requirements based on user assessment of RTI 1.0 capabilities**

    - **Other inputs requested from MOM users**